

MS # P-041t

Project # 7

O K H

Vol XX

TRANSPORTATION SERVICES

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HISTORICAL DIVISION
EUROPEAN COMMAND

MS # P-041t

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Neustadt, 11 November 1947

Volume **XI**

THE PLANNING BRANCH OF THE CHIEF OF TRANSPORTATION

Its Mission and Its Work in the Planning and Reconstruction of the
Russian Railway Network
1941 - 1942

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After studying national economy at the Erlangen University, Hans KLEIN joined the Army in 1932, entering the 7th Artillery Regiment as an officer candidate. In 1933 - 1934 he underwent officer training in the Dresden Infantry School and received his commission as Lieutenant on 1 October 1934. Following numerous assignments with the field forces, during which he took part in the Polish and French campaigns, he was given training for the Army General Staff in Berlin in 1941 and then assigned to the OKH Chief of Transportation where he served in the planning as Technical Officer for Operational Railway Transportation. In March 1943 KLEIN, now a major, was transferred as Operations Officer to headquarters of the General of Transportation, Southeast, at Salonika and in August of the same year was appointed Authorized Transportation Officer to Army Group E, Salonika. Promoted to Oberstleutnant in July 1944 he was assigned as Operations Officer to 369 Inf Div in Yugoslavia in September holding this assignment until captured in Bleiburg, Corinthia Province, Austria, on 14 May 1945.

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Prefatory Remarks

In contrast to the campaign against Russia, the campaigns of 1939 and 1940 took place in a relatively limited area provided with a generally good and tightly organized road net which permitted the troops to be supplied to a large extent by truck. The railways were important only so far as strategic concentration in preparation for campaigns was concerned.

In the campaign against Russia, the railways were forced to play a substantially greater part in the supply of personnel and material because of the vast distance to be covered. However, this consideration did not carry very much weight; the high command hoped to annihilate the Russians within a short time by means of the breakthrough of strong Panzer forces, as in the case of France. Sufficient motorized columns were available for the short time which it was thought would be necessary to overcome resistance. This estimate proved to be erroneous. Moreover, in the center of the eastern front especially, the Russian road net was so poor that the wear and tear on motor vehicles exceeded all expectations. When rains made roads impassable for motorized traffic over wide areas in the East, the importance of railways increased immensely. I believe that in the future also, in spite of planes and atom bombs, railway will not lose their importance as a means of mass transportation in the East.

It is the purpose of the following report to show what was achieved in the field of planning and reconstructing railway lines during the first years of the Russian campaign. Individual technical problems have not been touched upon. Such things are part of the mission of the railway engineer and railway operating troops.

I. General Summary of the Missions of thePlanning Branch

The Planning Branch provided the preliminary conditions for the movement of transports, from the point of view of organization and reconstruction. After timely briefing regarding planned operations had taken place, this agency organized the manpower and the materiel to repair and restore traffic on railways, through roads and waterways which had been damaged. After operations had begun, the Planning Branch was responsible for repair of the railway network, through roads and waterways, improvement and increase in capacity of the railway network, procurement of personnel for railways and waterways after they had been repaired, construction of field and overhead cable railways to supplement the standard gauge railway network and issuing of up-to-date maps showing the latest situation of railways which had been repaired and the condition of the roads. In the occupied territories, it took care of improvement of the railways, through roads and waterways and dismantling of military bridges constructed for previous operations.

II. Organization of the Planning Branch

In accordance with the mission described above, the Planning Branch was organized as follows in 1941, before the start of the Russian campaign, headed by a Branch Chief and an Administrative Officer:

A. Organizational Group I (Group I)

1. Group Chief.

2. Ia charged with organization, reorganization, wartime tables of organization, service regulations of the transportation agencies.

a. Ia E/W preparation of personnel of the Reich Ministry of Transportation for transportation agencies.

b. Ia S preparation of personnel of the Inspectorate General of German Roads for transportation agencies; supply of building materials and equipment.

3. Ib E actual organization of transportation agencies.

4. Ic --economic matters.

5. Id --compilation of field manuals for the transportation system.

B. Planning and Reconstruction Group (Group III)

1. Group Chief.
2. IIIOp -- railways and road construction during operations;
commitment of railway engineer troops, electrification.
3. IIIOa -- improvement of the railway network in other territories, in co-operation with the following:
 - a. IIIOa0, -- for the East, exclusive of Russia.
 - b. IIIOaW, -- for the West.
 - c. IIIOaSO, -- for the South-East
 - d. IIIOac, -- situation, traffic and track reports.
4. IIIOs -- planning and construction of the Reich autobahns and
of national and regional roads.
5. IIIOw -- planning and construction of waterways.
6. IIIOK -- mapping.

C. Group for Operation, Traffic and Procurement (Group IV)

1. Group Chief.
2. IVb, -- railway operating troops, railway artillery batteries,
armored trains, protection of communication routes.
3. IVc, -- tariff and traffic regulations.

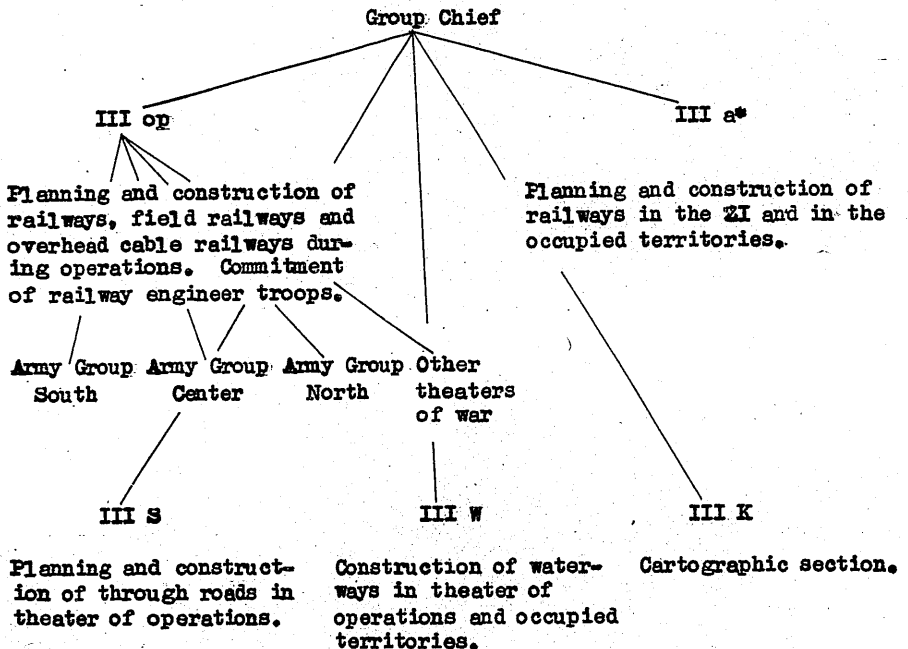
4. IVe, -- quarters for transportation agencies, communications between branches.
5. IVf, -- raw materials quotas and funds; vehicle program of the Reich Ministry of Transportation; stocks of coal used for the service.
6. IVf 1,-- rolling stock, loading equipment, special vehicles, command trains, hospital trains and trains for "walking wounded"; materials for permanent ways.

D. Modification of Organization

For its transfer to Headquarters, OKH, the Planning Branch, prior to the start of the Russian campaign, was divided into a first and second echelon. The first echelon, which went into the headquarters of the OKH, was composed of the personnel encircled in blue in the organization summary.

After only a few days it became apparent that the personnel in Group III was far from sufficient. Accordingly, after a few weeks, organization of Group III was modified as follows:

1. Planning and Reconstruction Group (Group III), 1st echelon



* So far as regards the personnel in III a, the personnel in III a0, III aW and III aS0 remain in the second echelon as before.

III. Preparations for the Russian Campaign of 1941

Preparations for planning and reconstruction of the railway network for the campaign in the East were insufficient. Practically, they were limited to the followings:

1. Moving the railway engineer troops into assembly areas in accordance with operational orders.
2. Preparation of equipment and building material depots near the front.
3. Moving 50 track and switch installing trains of the Reich railways into the assembly area, in support of the railway engineer troops.

The chief reasons for the insufficiency of preparations were twofold:

1. In high places it was believed that the campaign could be won by means of deep penetrations by Panzer armies, destroying enemy's main forces in border battles in the West of Russia, and that after this all that would remain to be done would be to occupy Russia. The railways were not a vital issue in this plan. However, Hitler's views in this respect were not shared by the OKH.

2. There was a lack of experience in the reconstruction of vast

railway networks. The Planning Branch had in practice not collaborated in the previous campaigns. For instance, the belief prevailed that the railway engineer troops alone would be fully sufficient to repair sections of railway that had been destroyed. The Chief of Transportation himself had agreed only reluctantly to the preparation of the above-mentioned fifty track and switch installing trains of the Reich railways.

Specific orders directed the reconstruction, initially, of one serviceable line in the area of every group of armies:

- a. For Army Group North, the line from Wilno to Duenaburg.
- b. For Army Group Center, the line from Brest-Litovsk to Minsk.
- c. For Army Group South, the line to Kiev via Shepetowka-Kasatin.

In this connection, double-track railways were to be reconstructed with an initial capacity of twenty-four trains a day, single-track railways with an initial capacity of twelve trains.

At least as far as the area controlled by Army Group South was concerned, this order was not suited to the situation. The line to be constructed via Shepetowka-Kasatin to Kiev was to have been reached through three junctions:

- a. via Chelm - Dorschnsk - Kowel
- b. via Munina (north of Przemysl) - Rawa Ruska (north of Lemberg) - Lemberg
- c. via Przemysl - Lemberg.

Line b had been selected because at that point a thrust in force aimed at Lemberg was to take place. For this reason it was hoped that it would be possible to reach Lemberg quicker along this route than along the main line from Przemysl - Lemberg.

Actually the line running from Munina over Rawa Ruska to Lemberg is definitely a secondary line with pronounced gradients and curves and a relatively large number of embankments, many of which had been destroyed. So far as I can recall, it was not fully repaired during the war, since from a military viewpoint it had no importance. It was a mistake to commit railway engineer troops on this line. They soon had to be recalled and put to work on the main line running from Przemysl to Lemberg, without which it would have been impossible to get along during the subsequent development of the operations.

At this point I should like to draw attention to what was, in my opinion, a fundamental mistake in the organization of the transportation system. The Foreign Section [Gruppe Ausland] was subordinated to the Field Transportation Branch. It compiled information regarding the railways of Germany's neighbors. In my opinion this section belonged in the Planning Branch. This would have been the only way of ensuring that Section III op, which planned railway construction during operations, received the necessary records from the Foreign Section in time. It would have been the only way of preventing the giving of orders to restore a line which was definitely secondary. It may be argued that co-operation was also possible by other methods. But the actual dist-

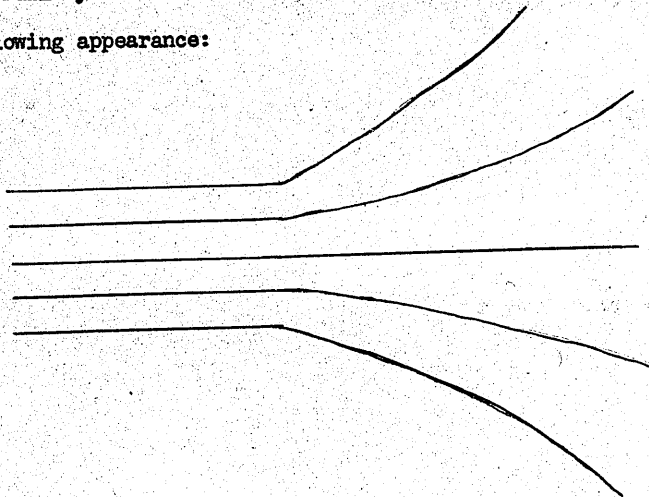
ance in space which separated the two agencies before the campaign against Russia alone would have made very difficult such close and continuous exchange of ideas as was necessary.

Preparation of the campaign for 1942, based upon the experience of 1941, will show how this problem can be solved. There is accordingly no point in going into details here.

IV. The Russian Campaign of 1941: Problems Arising and their Solutions

A. Committed Strength

The railway network from Central Europe to Russia has somewhat the following appearance:



The closely-knit high-capacity Central European network becomes an essentially thinner, less efficient network.

Originally, because of the idea that the campaign would be a short one, it had been believed that one line per army group would be sufficient.* On the basis of the course operations were expected to take, these lines had been selected in advance. It was believed that the current strength of railway engineer troops would be sufficient for all purposes.

* See C, below.

In accordance with the experience gained during the first year of war in the East, the following methods should have been adopted:

1. Construction and repair of railways depend on manpower.

Therefore, the following plan for troop utilization should have been followed:

- a. The military formation of the railway engineer troops should have been committed for work on lines which were essential, so that traffic could proceed as soon as possible and the routes for supply columns be shortened. These troops would have constituted the first wave.
- b. After them should have followed Wehrmacht contingents such as overhead construction detachments, switch control tower construction detachments, signal construction detachments, track and switch laying detachments and water supply point construction detachments to make the line ready for immediate use. These would have constituted the second wave.
- c. In the long run and in view of the great distances involved in Russia, all existing railways should have been used. As the third wave, bridge construction detachments, track and switch laying detachments, switch control tower and

signal construction detachments, etc, should have been employed, and additional East-West lines should have been developed to relieve the traffic load on the main routes. Railway engineer troops should have been used only for reconstruction jobs which were likely to take some time, such as the construction of big bridges with the aid of military bridging equipment.

2. So far as selection was at all possible in the vast spaces covered by Russia, the order stating which lines were to be built by the first and second waves should have been given after the findings of the reconnaissance units had been received.

3. Accordingly, strong reconnaissance detachments equipped with wire and radio should have been committed on all lines. It would have been preferable to use double-purpose, two-track rail and road trucks for this.

4. Once a decision regarding which line was to be reconstructed first had been reached, on the basis of reconnaissance, this decision should not have been altered unless absolutely necessary. A shift of manpower results in considerable loss of working hours.

5. Military protection would have had to be given to reconnaissance units, because in Russia the railways often are far from the roads along which, as a rule, military operations take place.

6. All reports concerning a specific line, including subsequent reports on its reconstruction, should be pasted into a "line book". By this means a "medical chart" of this particular line will at all times be available.

B. Equipment of the Railway Engineer Troops

It is not my mission to speak about the technical equipment of these troops. I should like to draw attention, however, to two points which are of decisive value as far as "technical commitment" is concerned. They are the following:

1. Motorization. A fully motorized unit of railway engineer troops sustains only a minimum loss in working days on the march and is ready for the new job on arrival. Allocation of column space by the armies is unreliable.
2. Means of signal communication. The railway engineer troops must be equipped with all the technical means of modern signal communication. When committed, they are always spread over large areas. Only in this manner will it be possible to control their activities without the loss of a great deal of time. Also, they must have at their disposal a sufficient number of railway signal communications regiments to restore the railway communication system quickly and set up the tactical command communications of the transportation system, which is indispensable to the latter. Traffic and control of transportation cannot be undertaken with-

out adequate communication facilities.

C. Conversion of Tracks to Standard Gauge.

1. Method

To the layman, the problem of converting tracks to standard gauge at border crossings into Russia appears to be a very difficult one. This is not the case.

We realized that in the long run it would be impossible to avoid converting the tracks in Russia. However, in order to be in a position to unload the motorized columns immediately, it was decided to leave the widegauge tracks in place and to use captured rolling stock to keep the traffic moving.

Very soon, the following two fundamental difficulties arose in this connection:

a. Especially as far as locomotives were concerned, the captured material was inadequate both in numbers and in quality.

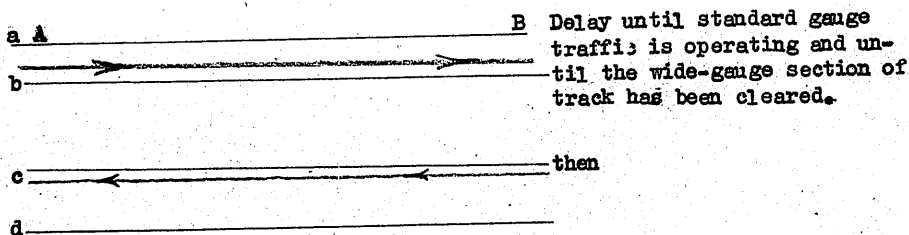
b. The Russians had either evacuated the railway operating installations and the railway repair shops in time or else they had destroyed them so that the few locomotives available could not be repaired.

As a result of this deviation from the original intention, it was necessary to begin conversion much earlier. This meant that the tracks concerned would be out of service for some days. To avoid this, wherever

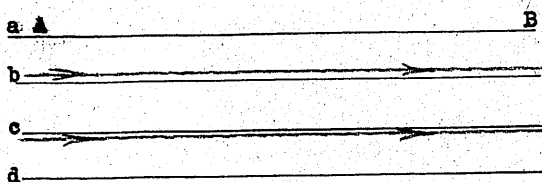
double-tracks were concerned one wide-gauge track was retained while the other one was converted to standard gauge. Once traffic had begun to move on the standard gauge tracks, the second wide-gauge track was converted.

Even this solution had its difficulties, especially in the stations where standard-gauge and wide-gauge tracks met. The great disadvantage, however, was connected with the manpower used. Conversion is a pure question of manpower. Theoretically any track, however long, can be converted within a short time. The only condition is that a sufficient number of men be distributed over the track as a whole. When, for instance, a company had to convert a 20 km long section of track, it had first to convert one track, covering 20 km for the purpose, and then to remain more or less idle until standard gauge traffic was in operation and the wide-gauge section had been cleared, whereupon it had to go over the same section of track again to convert the second track.

Impractical Method



Practical Method



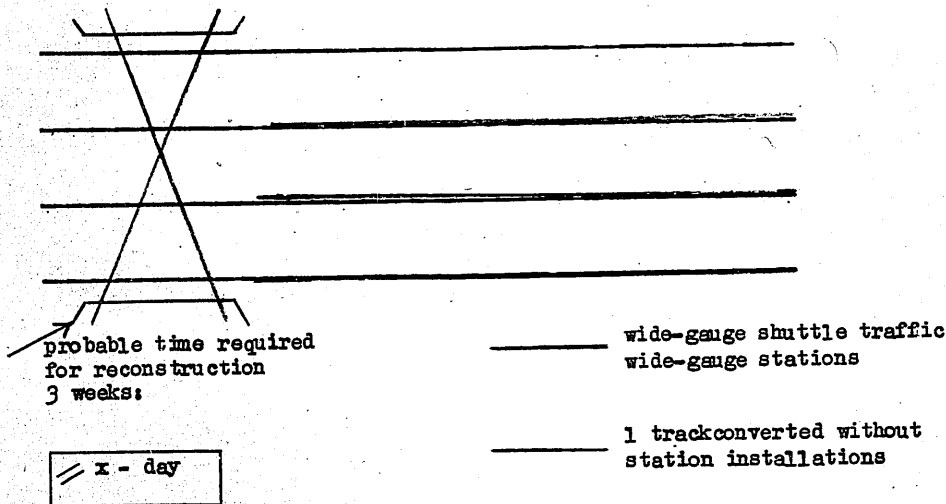
It is obvious that when conversion of both track b and c is made at the same time required is greatly shortened, since the 20 km distance need be covered only once and the delay at B is avoided.

The difficulty connected with clearing the tracks of wide-gauge rolling stock is a factor in both solutions. The wide-gauge cars can be side-tracked somewhere. Their conversion presents no difficulties. The locomotives should be grouped together in the neighborhood of a railway workshop. They cannot be converted to standard-gauge, but they can be used as boilers, heater cars, etc.

2. Principles Based on Experience

a. It is advisable to convert tracks to standard gauge from the very outset, when undertaking reconstruction of a section of railway. Almost always, small bridges have been demolished, which hinders both wide-gauge and standard-gauge traffic. For a while the troops will have to carry on without railway supplies of any kind. This is offset by the fact that after conversion the capacity is at once relatively high.

b. In cases where large installations have been demolished so that operation of standard-gauge traffic is made impossible for a lengthy period, a wide-gauge shuttle service behind the obstacle can be operated. On double-track sections of railway, one track should be converted to standard-gauge immediately, exclusive of station installations. Conversion of station installations and the second track should be started early enough so that when the obstacle has been removed traffic on standard-gauge tracks can be taken up immediately.



Probable time required to clear section AB of wide-gauge rolling stock, inclusive of conversion of the station installations, would be 4 days.

AB x - 4th day: Stopping of wide-gauge shuttle service -- clearing of wide-gauge sections of track - conversion.

c. Immediate reconstruction and/or conversion to standard-gauge also avoids the necessity of building unloading stations, which ties up a great deal of manpower.

d. Unskilled labor can be used to a great extent for the conversion. The railway operating troops will have to be provided with sufficient specialized tools to equip these labor forces.

e. In Russia none of the railways were furnished with iron ties. Conversion of such railways would have been very difficult and would have taken a great deal of time. It is advisable that such sections of track be placed in the second class of priority for reconstruction purposes from the very outset. Special tools for conversion of iron ties would eventually have to be developed.

D. Construction of Railway Operation Installations

1. Difficulties

The Russian wide-gauge locomotive was superior to the German standard-gauge locomotive. It had a greater volumetric capacity for water and coal and was sturdier in construction. That is why, from the German viewpoint, there are such great distances between railway operation installations. For example, on the line running from Brest to Smolensk, distances between such installations were as follows:

BW Brest	)	150 km
BW Baranowicze	)	
BW Minsk	)	130 km
BW Orscha	)	150 km
BW Smolensk	)	120 km

I cannot recall in detail the technical reasons why these distances from BW to BW were too great for German traffic, but it is of particular importance where emergency traffic is concerned, such as operates at first on all seriously damaged and temporarily repaired sections of the railways. In any case it was necessary to construct new emergency BW's in addition to those which were repaired. On the line mentioned above, for example, the following installations were constructed:

- a. Between BW Brest and BW Baranowicze, the railway operation installation of Oranczyce, equipped with a turn-table [Wende-BW].
- b. Between BW Baranowicze and BW Minsk, the BW of Stolpec, with turn-table.
- c. Between BW Minsk and BW Orscha, the BW of Borisow, with turn-table.

The reconstruction of a BW which has been damaged is in itself a

* BW (Bahnbetriebswerke): Railway operation installations.

task which ties down considerable forces. Often masonry work is necessary for the reconstruction of locomotive sheds, repair shops, slag-pits, etc, and technical work which requires relatively a great deal of time, in rebuilding, for example, coaling installations, water supply station installations, signal box and signal installations. Construction of the required railway operation installations equipped with turn-tables could accordingly not be undertaken at first with the forces available.

In addition to this, there was the circumstance that the Russians had either taken away or destroyed the machine tools in the BW's and EAW's [Eisenbahnausbesserungswerk: railway repair shop]. Both BW's and EAW's had to be re-equipped with machinery.

2. Principles Based on Experience

a. The Russians are fully aware of the importance of the BW and EAW for the enemy's railway traffic. Such installations, together with their machinery, are accordingly taken away or destroyed. Adequate manpower must be available for the work of reconstruction. The machinery required for these installations must be available in adequate quantities near to the front, and a smooth flow of machinery supplies must be arranged for.

b. The Russian BW's, because of the better performance of the Russian wide-gauge locomotives, are situated at great distances from each other. German emergency traffic required the construction

of new BW's between those that existed. Manpower and matériel as well as machinery should be available for this purpose.

E. Water Supply Stations - Water Decalcifying Installations

1. Difficulties

As mentioned under D. above, the Russian locomotive, thanks to its size, is able to take on more water than the Central European standard-gauge locomotive. The distance between water supply stations was accordingly greater in Russia than in Germany. In addition, the Russian railways had been constructed for smooth peacetime traffic only.

As a result, it was necessary not only to repair the water supply stations, most of which had been destroyed, but also to build new ones between those existing. This became even more necessary when Partisans frequently interrupted traffic on the lines, so that there was danger that locomotives might be delayed for an appreciable time before reaching a water supply station.

In some districts the procurement of water presented special difficulties. I remember clearly the example of the line from Dnjepropetrowsk - Donetsk Basin. The available water decalcifying installations had been destroyed. Loss of locomotives as a result of the abnormally hard water threatened to paralyze traffic.

2. Principles Based on Experience

a. Existing water supply stations nearly all destroyed. After

repairs they are insufficient for German traffic because of the distance between them. Additional water supply stations will have to be built.

b. Water supply hard to come by almost everywhere in Russia, but especially in the district between the Dnjepr and the Donetsk Basin. Construction of decalcifying installations is necessary.

c. Manpower and material for these missions must be made available.

F. Structural Capacity of Lines. - Structural Capacity of Junctions

Together with the order for reconstruction of a section of railway, orders were given as to the capacity to be attained. When, however, a double-track section of line had been reconstructed for the purpose of attaining a capacity of 36 trains per day, as a rule this capacity was not attained. On the basis of this recognized fact, the following measures were taken:

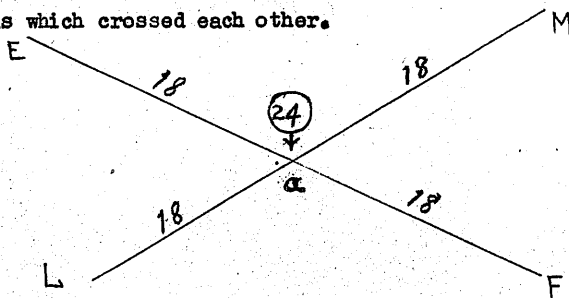
1. The railway operating troops, in conjunction with the railway engineer troops, worked out a data sheet. This sheet stated the minimum construction necessary to produce a given capacity, as for example 18 trains daily. If these minimum requirements were fulfilled the section of line had a "structural capacity" of 18 trains per day.

2. "Structural capacity", accordingly, signifies that over a section running from A to B a specific minimum structural requirement, for a stated capacity, has been attained, without taking into account

whether or not, as a result of difficulties such as lack of locomotives, coal and personnel, poor loading performances, etc, this capacity is actually attained.

3. When transfer of the line was effected, the railway operating troops had to confirm in writing that the structural capacity could be attained. When transfer was made from the military formations, the field railway headquarters, to the Reich railways, transfer and acceptance had to be made in writing. Only thus was it possible to avoid subsequent arguments regarding structural capacity.

4. When two lines which crossed each other had been constructed to yield a specific capacity, theoretically the capacities of both lines should have existed at the point of intersection. In most cases this was impossible, especially when the intersection was at the same time a BW. On this basis the concept of "structural junction capacity" had to be introduced. This capacity controlled the capacity of both sections which crossed each other.



Junction a could only attain a capacity of 24 trains a day from various directions. As a result, line E - F, for example, was available

for only 6 trains if a capacity of 18 trains was furnished by L - M.

G. Precautions against Winter Conditions

The winter of 1941 to 1942, which made for serious difficulties in many fields, also affected the transportation system. Great efforts were necessary to overcome them. In the field of railway construction the following points were essential:

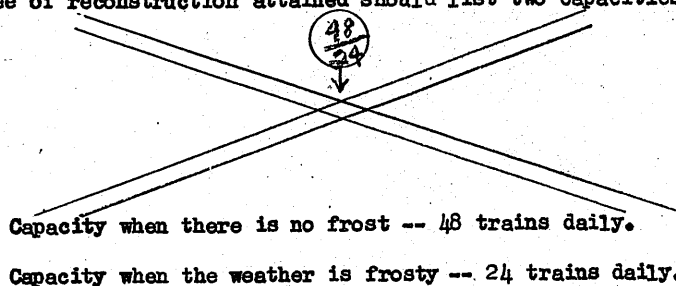
1. Lines: Customary precautions against snow drifts (snow barriers) had to be increased. In addition, snowplows and track-sweepers [Schneesleudern] in adequate numbers had to be available. It was necessary that both types be available at the same time because they supplemented each other during different climatic conditions. On a number of lines, the natural snow barriers, such as woods, bushes and hedges, had been cut down to prevent Partisans from approaching the line unseen. At such places artificial protection had to be provided immediately.

2. RW: Here experts will have to supply the details. It should be pointed out, however, that locomotive sheds and repair shops had to be heated, water supply stations given protection against frost and switches ensured against freezing.

3. Bridges: The manpower available was insufficient to take care of both protection against frost and reconstruction at the same time. Extra forces had to be committed for this purpose. Co-operation with

the waterways agencies to ensure early reports regarding ice conditions was required.

4. If work on protection against winter conditions for the BW's is delayed, the sheets giving the lines' capacities on the basis of the degree of reconstruction attained should list two capacities.

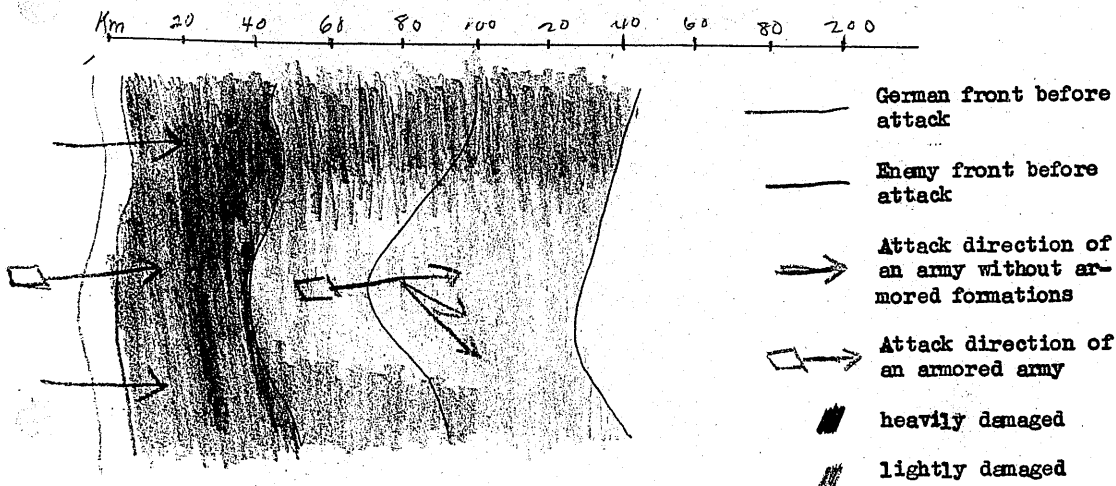


Only in this way can the top-level agencies gain a clear picture regarding the railways' capacity in winter.

H. Demolition Measures Undertaken by the Russians

The Russians are past masters in the art of demolitions. During the War they gained additional experience in this field. In the first months of the War, demolitions were not too great an obstacle. They increased after the lengthy pause in operations which took place in the fall of 1941 on both sides of Smolensk. They reached a maximum during the year 1942, at the time of the attack on the southern front.

In any case, something like the following picture resulted:



1. Zone 1

The first zone of demolitions covers a depth of approximately 40 to 50 km. Here the demolition work had been thorough. To wit:

a. From the Russian railhead to the front all tracks removed. Often the embankments had been blown up so that rebuilding required large-scale earth work.

b. All artificial installations including even the smallest culverts and bridges blown up.

c. All telephone poles on the railways either removed or demolished.

d. All signal boxes and installations either removed or demolished.

e. All rolling stock removed.

f. No stocks of fuel available.

g. All installations for the care of locomotives either removed or destroyed.

h. A great number of demolition charges with time fuzes in railway embankments and station buildings.

i. Beginning approximately with the year 1942, the indigenous railway personnel, too, was evacuated in time and foreign personnel from other regions employed on the lines. This was done to prevent the indigenous personnel from remaining behind during withdrawals, since as a rule the families remained behind and later took up service with the Germans.

2. Zone 2

a. Within the scope of authority of armies without armored formations:

The tempo of the German advance was too slow to prevent the prepared obstacles and demolition measures of the Russians. On the whole, therefore, there were extensive demolitions which reached from 75 to 80 percent of those in Zone 1. Another feature is that on double-track lines one of the tracks had been removed. On single-track sections the ties and the rails had been ripped up to a great extent.

b. Within the scope of authority of the armored armies:

The breakthrough was effective. The rapidity of the German advance hindered execution of a number of delaying measures. In contrast

to a, in general the following installations were found either intact or only partially damaged:

- (1) The tops of the roadbeds on open sections of track. In the stations, the extent of the track and especially of the switch demolitions was reduced by about 50 percent.
- (2) The communications network was damaged only to a feeble extent. Only the larger switching centrals were put out of commission. Telephones were lacking.
- (3) Some locomotive maintenance yards were only partially damaged.
- (4) Limited fuel stores were available.
- (5) Demolition of switch towers and signal installations was carried out only in part.

3. Zone 3

a. within the scope of authority of armies without armored formations:

There was a decrease in demolitions, although not to a decisive extent. The top of the roadbed on open sections of track was preserved to a great extent because the Russians used the lines up to the last minute for evacuation. On the whole, there was about 60 percent of the degree of destruction encountered in Zone 1.

b. Within the scope of authority of the armored armies:

The break-through had gradually reached open ground. Demolition was limited to the larger artificial installations and rough destruction of locomotive maintenance installations in the railway operating installations. In between the demolished artificial installations, the railway engineer troops and railway operating troops with the armored armies could begin work on emergency traffic. Indigenous railway workers soon returned to work and co-operated.

4. Conclusions

a. When preparations are made to undertake large-scale operations the Chief of Transportation must see to it that at least one high-capacity line is situated within the main zone of advance of the armored armies, because only such a line can be restored to traffic in time to support the operational command. If, however, in an effort to wage a battle of extermination, a break-through of the armored forces for the purpose of attacking the enemy from the rear is the only condition for success, then personnel and materiel must be prepared to such an extent and provided with sufficient motor transportation and planes that the expected demolitions of railways and the means of operating them can be offset.

b. Attacks by one's own planes before the start of operations in this zone of main effort must be made only on objectives, such as

large bridges, which the Russians would be certain to destroy in any case. This hinders assembly of the enemy's forces and his supply services without making it necessary later for one's own troops to rebuild installations destroyed by one's own air force.

a. In respect to military bridge equipment, see the following section.

I. Military Bridge Equipment

For rapid reconstruction of large bridges which have been demolished, pre-fabricated military bridge equipment is absolutely necessary. At the begin of the War, the railway engineer troops had on hand only an inadequate quantity of such equipment. As a result it could be used only in special cases. This greatly increased the time required for restoration. A further disadvantage was the far greater number of piers required for emergency bridges on account of the fact that the spans would have to be shorter. This increased number of piers narrows down the free flow of the river and raises the danger of damage by ice-drifts.

Military bridging equipment fit for the purpose must cover a wide span. Individual parts must be suitable for loading on trucks or better still on large transport planes to take it to the building-site. This makes it possible to start building big installations in Zones 2 or 3 even before reconstruction has been completed in Zone 1.*

* See section H, above.

J. Field Railways

The facts that the Russian railway network was very thinly spread and the roads bad, in many cases unusable during heavy rainfall and always impassable during the muddy periods in spring and fall, made it necessary, when the fronts were stationary, to supplement the standard gauge railways by constructing field railways.

This was arranged in the following manner:

1. The field railway equipment was distributed by the Chief of Transportation. He kept the Generalquartiermeister informed regarding current stocks.
2. This enabled the Generalquartiermeister to check the orders he received for construction of field railways and to classify them on the basis of priority. He thereupon ordered the Chief of Transportation to begin construction.
3. The Chief of Transportation furnished the materials and the instructions crews for the construction. The rest of the manpower had to be furnished by the troops.

A disadvantage which soon became apparent was that the field railways available in Germany in industry had different gauges, including 60, 75 and 90 cm widths. Moreover, the locomotives and cars of field railways which were not of Army origin were for the most part suited only for construction traffic of short duration, not for great dist-

ances with a proportionately high capacity.

It would have been necessary, therefore:

1. To have available large quantities of field railway equipment, above all, locomotives capable of giving a good performance.
2. To institute a uniform gauge for home industries. For Germany, a gauge of 75 cm was foreseen during the war.
3. To ensure by means of state subsidies that field railway locomotives and cars to be built for industry are adaptable for use in war-time.

In the East several hundred kilometers of field railways were built. The biggest projects, in the curve of the Don west of Stalingrad, were not completed. The smaller lines in the center and the north of the Eastern front, which averaged 50 km in length, fulfilled their purpose very well. The average daily capacity of a field railway line amounted to 500 tons. Some railways, for example, the field railway in the Demjansk pocket, reached a capacity of almost 1000 tons daily. The longest line was built in Finland and ran from Hyrynsalmi via Kuusamo to Kiestinki.

In the future, too, when the fronts are stationary, the field railway will be indispensable as an auxiliary means of transportation.

K. Overhead Cable Railways

In the East the overhead cable railways proved their usefulness.

fully where bridges had been blown up along railway lines and in the supplying of the troops in difficult terrain. In all cases, their capacity of 250 kg per car was sufficient.

Their use on the front at Petsamo made it possible for the first time to supply the troops in this pathless terrain.

I. Map System

The cartographic section was assigned to Planning Branch Group III. In peacetime it drew up maps of the railway systems in Germany and the other European countries in accordance with the information available.

The cartographic section created an exemplary railway map in which the essential features of the system were clearly shown. In addition to rivers, the latest maps indicated the mountains in fine hachures, so that it was possible to obtain an accurate idea of the terrain which the railways crossed.

In addition, the cartographic section made schematic maps showing the railways in the East, and every month it issued a new map showing the capacity of the lines with the latest status of reconstruction work. It also regularly provided maps showing the condition of the roads. The attached section of a railway map* is given as an example.

* The section of railway alluded to is included in Volume 18, Chapter 2, as Appendix 3.

V. Preparations for 1942

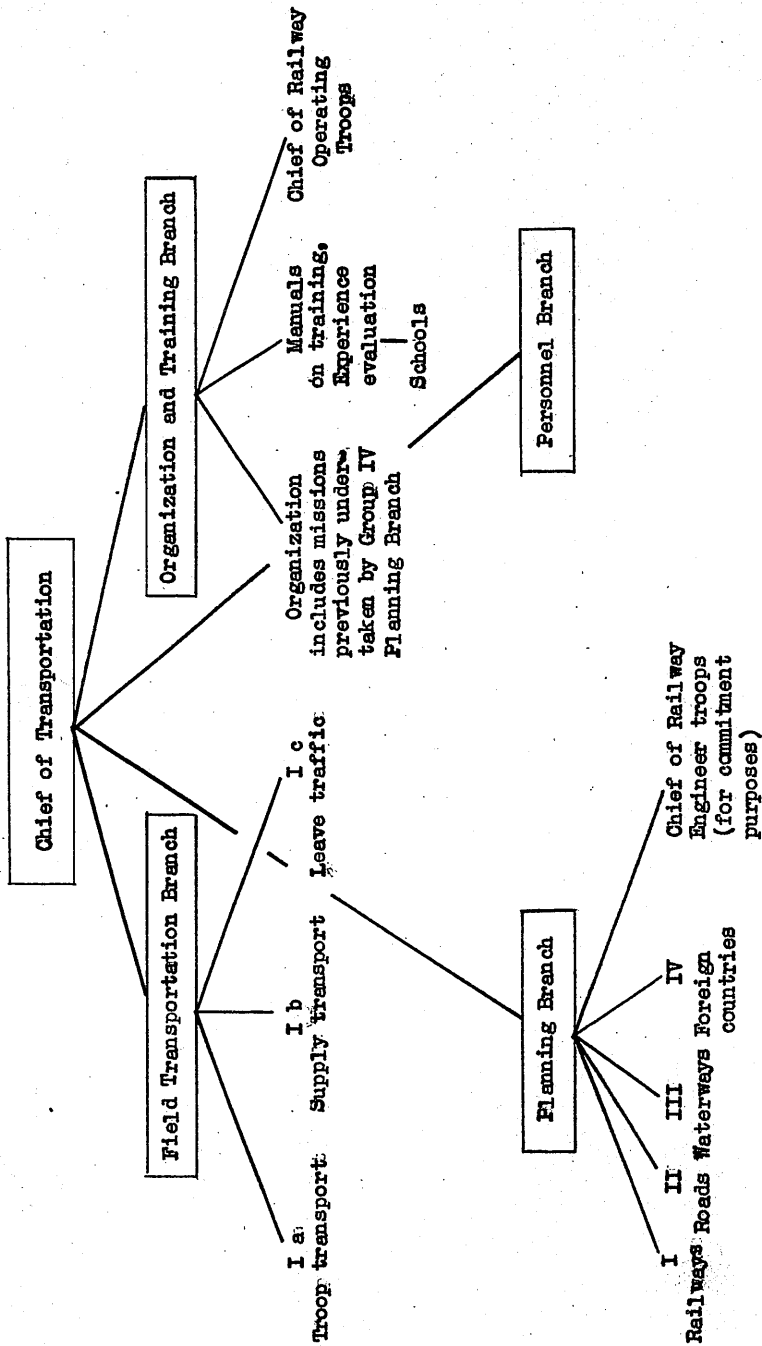
I have already* pointed out that preparations for the 1941 campaign were inadequate. The following preparations proved to be advisable for the year 1942:

A. "Ostbau 42"

Railway reconstruction work and an increase in structural capacity are things which take a long time. Accordingly, they should be planned far in advance, to enable all agencies participating in the work to assign the manpower and materiel available in an efficient manner. For this reason a vast construction program was drawn up for the year 1942, the "Ostbau 42".

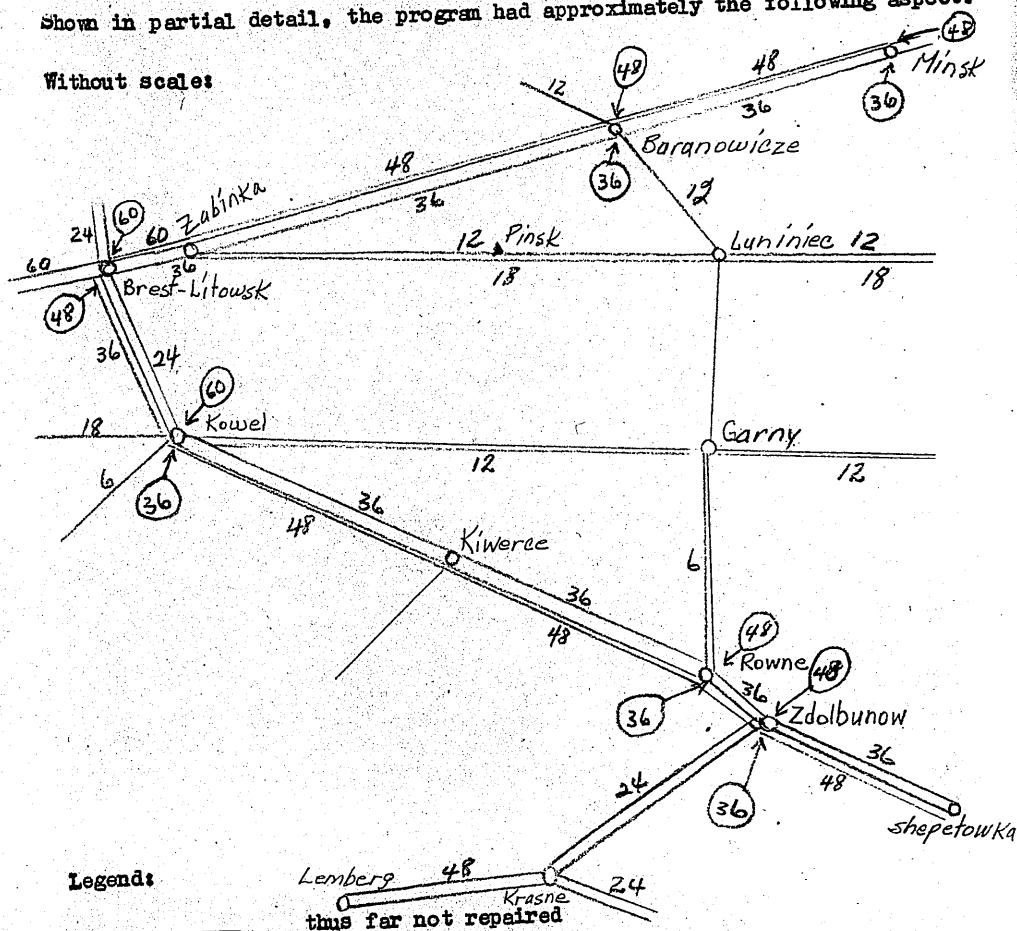
Requirements as far as additional construction and increase in capacity were concerned were listed on a chart; the agencies participating, the railway engineer troops, Todt Organization and the Reich Ministry of Transportation, were called in for a conference in the winter of 1941 - 1942. During this conference the work was distributed, procurement of material arranged and, circumstances permitting, curtailment and changes in the projected program undertaken.

* See Part III, above.

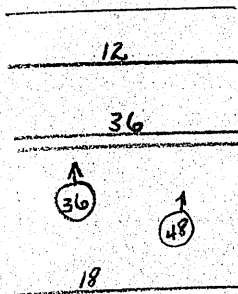


Shown in partial detail, the program had approximately the following aspects:

Without scale:



Legend:



single-track and double-track lines repaired (standard-gauge)

current capacity of 12 and 36 daily trains on the basis of present state of reconstruction

structural junction capacity required on basis of "Ostban 42"

structural line capacity required on basis of "Ostban 42"

The extent of this construction program can be demonstrated by means of the following two facts:

a. Approximately 1,000,000 tons of steel were used in the Ostbau 42.

b. As far as I am able to remember, the following railway lines were built with double-tracks in the Year 1942 alone:

- (1) Kovno - Wilna - Duenaburg - Pleskau.
- (2) Bohdanow (south-west of Molodeczno) - Molodeczno - Polozk.
- (3) Duenaburg - Polozk.

B. Preparations for Operations

The program for construction during 1942 was fundamentally concerned with the reconstruction of lines in the rear zone which had so far not been used for traffic and with increase of capacity and precautions against winter damage to lines which had already been repaired. Preparations for operations planned for 1942 had to be made separately.

Preparations were based on experience gained from study of the demolitions of 1941.* Inasmuch as the Russians were certain to prepare their demolition program for 1942 on an even greater scale than before, all previous experience and comparison values had to be increased accordingly.

* See Section IV, B, above.

With the assumption that military operations would proceed according to plan, an approximate calculation was made of the manpower, material and time needed to reconstruct the lines which would fall into our hands. This came very close to the actual situation, as it later developed.

On the basis of these calculations, railway engineer troops, railway construction battalions and railway construction forces of the Todt Organization and the Reich Ministry of Transportation were alerted. The necessary construction materials for building bridges and permanent ways were stocked in depots near the front. In this way it was possible, for example, to move bridge-building material which we knew, on the basis of information regarding specific and especially important bridges, that we would need into depots near the front in advance of operations.

In addition to this, it was possible to obtain a clear and, as it proved, a correct picture of the railway situation in a future theater of operation by study of the pertinent literature, interrogation of prisoners of war from the theater, and, above all, examining professional railway workers from that area, as well as Germans who had resided in the district over a long period of time.

For instance, it was clear that on the sections of line running from Rostow to the Caucasus and from Rostow via Salsk to Stalingrad there would be difficulties in the water supply. On the last-mentioned line the Russians had employed "kondenslok" [condenser locomotives] in which the steam from the locomotive was precipitated and returned to the ten-

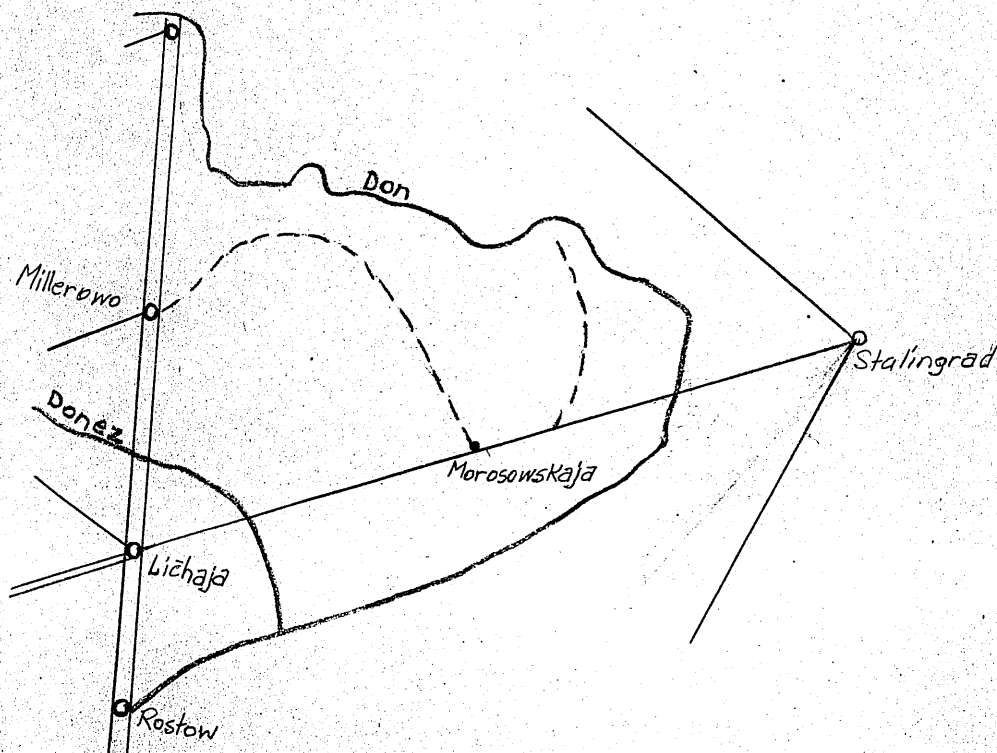
der. Since it was impossible to convert the gauge-width of Russian locomotives and since, on the other hand, the tracks, in accordance with previous experience, were to be converted to standard-gauge, the Reich Ministry of Transportation was asked to construct German standard-gauge "kondenslok" for traffic over this section of the line. In addition, the Reich Ministry of Transportation had been told to fit out tank-trains as portable water supply stations, furnished with heating-apparatus for the winter.

Another special question was that of the coal supply. On the lines to the Caucasus the Russians used "massut", a by-product of oil extraction, for fuel. We now had to arrange for the supply of these lines with coal and the provision of coaling installations.

In order to supply the Don front, construction of a vast railway network had been planned. Corresponding preparations in respect to material and personnel had been made. Fifty percent of the network had been completed when the Russians broke through the Rumanian-Italian front west of Stalingrad, in the winter of 1942-1943. The total length was to reach approximately 350 km.

===== standard-gauge railway network

----- planned field railway network



It was only because of these intensive preparations that the railways were able to follow the front relatively swiftly. The Russians had destroyed the lines east of the Donetz basin, in Zone 1, so thoroughly that reconstruction of the line running from Taganrog to Rostov, for example, was almost equivalent to building a new line.

In accordance with previous practice*, however, the subsequent demolitions, as for example those from Rostov in the direction of the Caucasus, were relatively small in number.

On the whole, the reconstruction of the railways in 1942, with the exception of such mishaps as always take place in a war, followed the trend predicted during preparations made in the winter of 1941-1942.

* See Section IV, h, above.

VI. Conclusions: Proposal for a Change in Organization

In the East, the railways were and are an indispensable means of mass transportation. Construction of railways demands time. That is why preparations should be made far in advance. It is for this reason that when operations are planned, the agency responsible for reconstruction of the railway network should be advised well ahead of time.

The most important points to be taken into consideration in this connection have been listed in Part IV. The form preparations should take has been briefly described in Part V. An efficient organization for the execution of these tasks is also a prerequisite.

In my opinion, the organization available to the Chief of Transportation did not quite measure up to the demands made upon it. While in the field agencies of the Chief of Transportation things had fortunately progressed so far that all manpower and agencies were subordinated to the Generals of the Transportation System* who were assigned to the zones of army groups, the necessary conclusions had not been drawn at top levels. Therefore there was constant parallelism, as for example between the activities of the Planning Branch and those of the Chief of Railway Engineer Troops. On the other hand, the railway operating troops were not even represented in OKH.

In view of this, I propose an organizational structure for the transportation command such as that outlined in the chart, Appendix 1.

* Vol XVIII, Ch 1, Page 47.